

The Innovator's Magazine JANUARY 1972



**The clock
that runs a plant**

Populist Scientific Crusades
(A Recipe for Increased Security) 8
M. B. Ettinger

An Economic Lesson from Developing Countries 10
Jack Baranson

Technical Managers—Where Do They Fit In? 14
John E. Spessard

Nylon 4—The Bridge between Synthetic and Natural Fibers 16
E. M. Peters and J. A. Gervasi

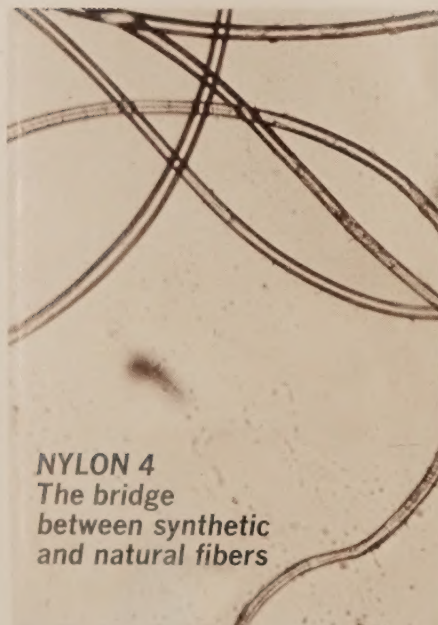
Institutional Origins of Eminent Chemical Engineers 26
B. R. Siebring and M. E. Schaff

Plasma Torches in Industrial Chemistry 31
P. H. Wilks and M. L. Thorpe

Everything You Always Wanted to Know About Portland Cement*
***But Did Not Ask** 38
Jan Skalny and K. E. Daugherty

Matter Through the Eye of the Association Theory Camera 46
Robert Ginell

Membrane Ultrafiltration
5. A Useful Adjunct for Fermentative and Enzymatic Processing of Foods 56
M. C. Porter and A. S. Michaels



NYLON 4
The bridge
between synthetic
and natural fibers

E. M. Peters
and J. A. Gervasi

Check List

The Industrial Chymist	1
View from the Top , Edgar Gemmell	2
Brownstein's Closet	3
Write On	5
Books	6
Out in the Plant	7
T & E	62
The Last Word	64

☐ How most effectively to sally forth as a knight of technology is here told by Ettinger, who gives us the itineraries for several Populist Crusades. 8

☐ Intricate interplays among technology, sociology, and local politics determine the success or failure of ventures in developing countries. Some ground rules are laid by Baranson of the World Bank. 10

☐ The sometimes painful transition from technologist to executive is examined by Spessard who asks, "Who needs technical managers?" 14

☐ "Where have our eminent chemical engineers been trained?" Siebring and Shaff give some insights. 26

☐ Conversion of plasmas, the so-called fourth state of matter, to economically useful products has been long delayed, in large measure by lack of scale-up data. Wilks and Thorpe describe their large torch, which produces both materials and data. 31

☐ Few people would give the right answer to the question, "What polymer is produced in largest tonnage?" The answer is cement, and Skalny and Daugherty tell about it. 38

☐ Association Theory is a conceptual scheme based on a kind of molecular-level snapshot. How such snapshots have been giving precise insights into physical phenomena is discussed by Ginell. 46

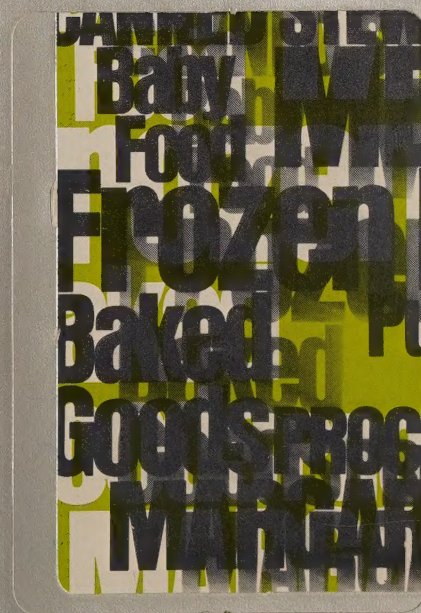
☐ Our series on uses of Membrane Ultrafiltration in foods processing is here concluded by Porter and Michaels' discussion of fermentation and enzymatic applications. 56

☐ Vigorous, persistent attack on the saw, "*It won't work. We tried it once.*" can yield a story like that of Dr. Barnes and his Nylon-4. Peters and Gervasi tell that story and give a status report on the fiber that shares properties with synthetics and naturals. 16

CHEMTECH

Contents

The Innovator's Magazine FEBRUARY 1972



Check List

The Polymer Industry—In Adolescence? 76
Norbert Platzer

To Stop or Not—The Big Research Decision 81
Richard T. Holzmann

Materials for Buildings 90
Lawrence T. Eby

The Impact on the CPI of Removing Lead from Gasoline 96
Bert W. Struth

An Automated Bench-Scale Flow Reaction Unit 98
W. B. Argo

Development and Evaluation of Biodegradable Analogues of DDT 105
Robert L. Metcalf, Inder P. Kapoor, and Asha S. Hirwe

Why Atomic Absorption Spectrophotometry? 110
S. L. Levine

MARCONAFLO and Its Use in New Mineral Development 116
M. J. Fraser and L. P. Connolly

View from the Top, Frank R. Mayo 65

Write On 66

Brownstein's Closet 68

Challenge, James F. Mead 70

The Industrial Chymist, J. A. Young 72

Books 124

T & E 125

The Last Word 128

☐ What's new in professionalism? Take a look at what Young had to say . . . ten years ago. (The Industrial Chymist is "hiding" behind him this month.) 72

☐ A global overview of polymer science and technology will be presented by an international group of speakers in several sessions at the April Boston A.C.S. Meeting. Here's a sneak preview of the symposium by Platzer, its organizer. 76

☐ Crawford Greenewalt once said that the mark of the good R&D man was that he knew when to stop. Here, Holzmann says when. 81

☐ The anticipated growth in residential building implies a corresponding growth in several sectors of the CPI. The chemical technologists contribution to these sectors is pointed up by Eby's article, "Materials for Buildings." 90

☐ Comparison of the quantity of chemicals made from petroleum with that of fuel from the same source makes one concerned that even minor perturbations in the latter can play hob with the former. Struth provides some quantitative insights. 96

☐ Because DDT concentrates as it moves up the food chain, it is crucial to have laboratory means to investigate this phenomenon. A mini-ecosystem and results of its use to evaluate new DDT analogues is described by Metcalf, the 1971 recipient of the International Award for Research in Pesticide Chemistry, and his co-workers, Kapoor and Hirwe. 105

☐ What's with Atomic Absorption Spectrophotometry? Levine details its uses and limitations. 110

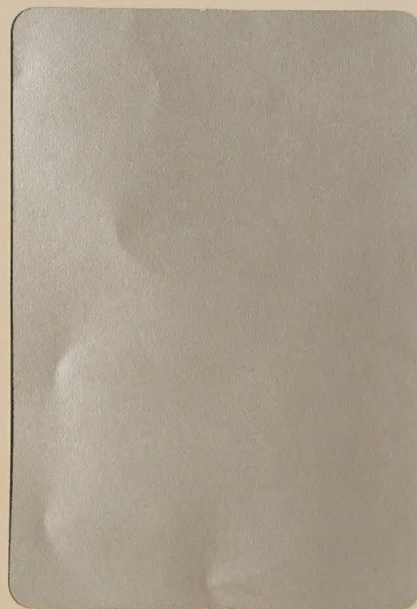
☐ Ships miles off shore can be loaded and unloaded with a variety of bulk solids by new slurry techniques. The technique and its impact on movement of ores and chemicals are evaluated by Fraser and Connolly. Potential effects on labor, raw material location, and off-sites capital are worth thinking about. 116

☐ Even bench scale reaction units can be automated to run around the clock. Details of a successful operation are presented by Argo. 98

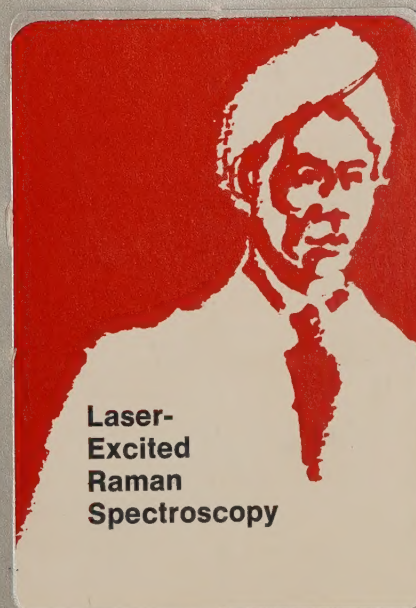


**The clock
that runs a plant**

W. B. Argo



The Innovator's Magazine MARCH 1972



**Laser-
Excited
Raman
Spectroscopy**

Information Pollution and the Ignorance

Explosion 139

James N. Butler

Energy: The Ultimate Raw Material 142

James Wei

Man-Made Ores and Their Uses 148

S. L. Blum

Foreign Job Opportunities 153

Robert H. Maybury

Protein Use Patterns—Current and Future

156

T. M. Hammonds and D. L. Call

The Importance of Temperature Approach

in Heat Exchangers 167

Yong Jai Yim, Paul Wellman, and Sidney Katell

PVC's Impact on Building 173

George A. Fowles

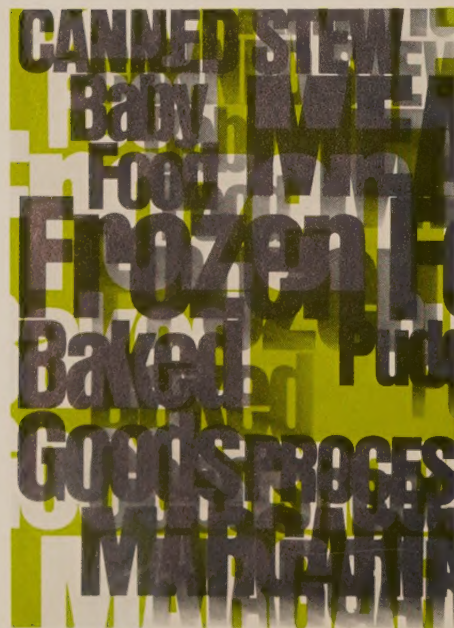
Polymers via Photocondensation 176

Jerry G. Higgins and Douglas A. McCombs

The Use of Free Radical Reactions

4. Inhibition 182

William G. Lloyd



Protein Use Patterns—Current and Future

T. M. Hammonds and D. L. Call

Check List

The Industrial Chymist 129

Write on 130

Brownstein's Closet 131

View from the Top, Jack Golodner 133

Books 135

Guest Editorial, George B. Brown 136

Challenge, Raymond L. Costa and Leo S. Harootyan, Jr. 163

Out in the Plant 189

T & E 190

The Last Word 192

□ At least some graduate students have learned how to solve problems—not only in chemistry but also in career planning. One of them, Brown, describes the conclusions of the research he and his colleagues did to learn what industrial work is really like. He has some suggestions for industry, too. **136**

□ When a tool gets too heavy to handle, its value is lost. The literature seems to be approaching that condition, but Butler offers some solace. **139**

□ Nothing happens without energy so it pays us all to keep tabs on it. Here's a viewpoint from Jim Wei. **142**

□ Why not think of solid waste as a raw material, an ore? This attitude is explored by Blum who uses high temperature incineration to illustrate what can be done. **148**

□ When job hopping some prefer to change fields rather than relocate. Others move. For restless souls Maybury provides an appraisal of the overseas job market and a compilation of sources of additional information. **153**

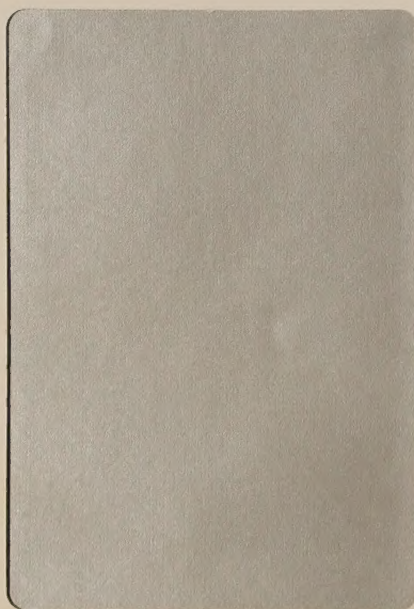
□ One way to conserve energy is to use all that you generate, but that's impractical. Yim, Wellman, and Katell exemplify the optimization of a heat transfer system in their design of an energy intensive process, coal gasification. **167**

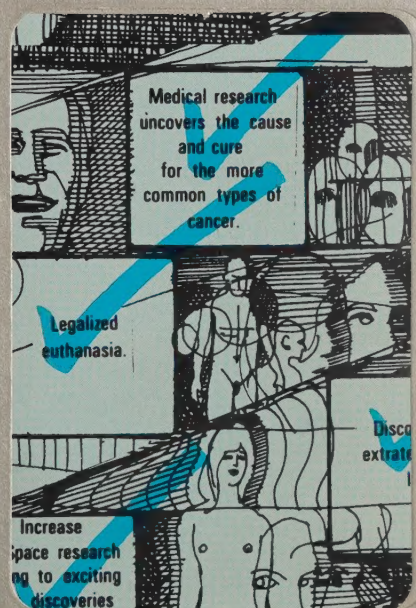
□ Building with PVC is the subject of Fowles' paper on this ubiquitous plastic. **173**

□ Polymerization catalyzed only by light, though still in the laboratory, portends promise and problems for the technologist. Higgins and McCombs bring us up to date. **176**

□ No discussion of free radical chemistry would be complete without a hard look at inhibition. Lloyd examines its "pros and cons" in concluding his series on radical reactions. **182**

□ What are the sources of protein in the U.S. and what do they portend for the future? Hammond and Call's study fills in some details. **156**





The Scientist in the Industrial Environment

4. An Examination of the Extremes 200
Carl Pacifico

Labels and Labeling 202
H. H. McIntyre

Electroplating on Plastics 205
Norman R. Roobol

What Happens When LNG Spills? 210
W. W. Crouch and J. C. Hillyer

Scholar on Skis—Hildebrand at 90 216
G. Wohlauer

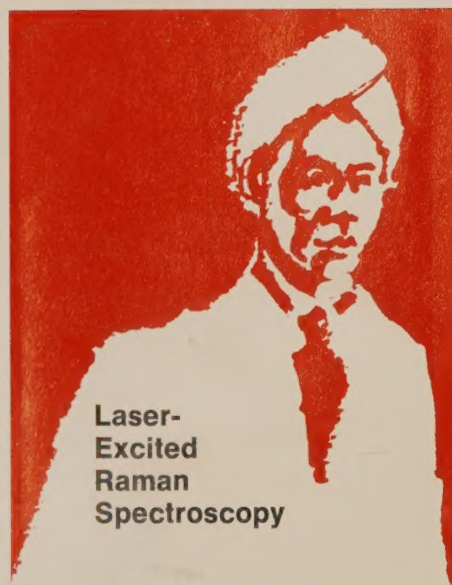
Noble Metal Ions—Noble Catalyst 220
D. M. Fenton and K. L. Olivier

Laser-Excited Raman Spectroscopy
1. Introduction and Experimental
Technique 226
J. L. Koenig

The Combustion of Polymers 232
Carlos J. Hilado

Electric Power—via Marriage of Chemical and Aerospace Industries 239
Fred L. Robson

Chemical Lasers: A Light Review 250
R. J. Jensen and W. W. Rice



J. L. Koenig

Check List

The Industrial Chymist 193

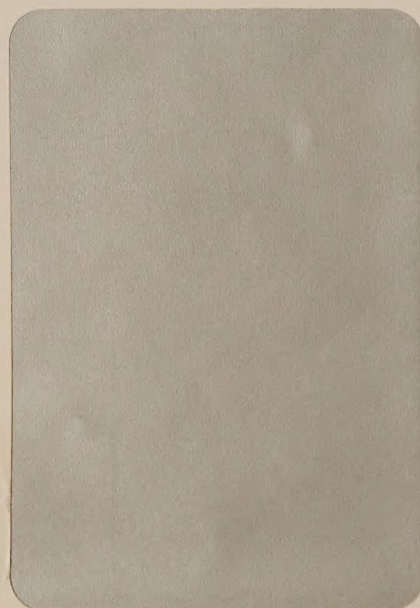
Write On 194

View from the Top, Carl M. York 195

Brownstein's Closet 197

Books 199

Challenge 256



☐ Are there really two communities with widely divergent views in the chemical profession? Pacifico illustrates what would result if there were in this concluding section of his series "Scientists in the Industrial Environment." 200

☐ Some say that we are tending to the all purpose label: "DO NOT USE THIS PRODUCT! IT MIGHT DO SOMETHING." McIntyre defines the real trends in product labeling. 202

☐ Manufacture of plastics that parade as metals offers many challenges to chemists of all specialties. These challenges are illustrated by Roobol in his discussion of this burgeoning class of materials. 205

☐ If you are concerned about what would happen if a tanker of liquid natural gas were to burst, Crouch and Hillyer's article will set your mind at ease. 210

☐ What better way to assess the impact of a chemist than by reviewing some of his own choice words. Joel Hildebrand's ninetieth birthday was celebrated in just this way by Wohlauer. 216

☐ The versatility of soluble noble metal catalysts seems to be without end. Here Fenton and Olivier review their work in the field. 220

☐ The focus of recent attention on flammability, coupled with the growing uses of polymers, makes an understanding of their combustion mechanisms most urgent. Hilado delves into the associated chemistry. 232

☐ That some profound creative thinking is needed to rescue us from an impending energy catastrophe is becoming increasingly evident. Robson has detailed an approach that draws on the capabilities of both chemical and aerospace industries. 239

☐ Did you know that the energies of chemical reactions can be channeled in ways that produce laser emission? Jensen and Rice tell how. 250

☐ Raman spectroscopy has been likened to a sleeping giant, which was recently awakened by the laser beam. Koenig begins a series that appraises the new applications and potentials of this exciting technique. 226

The Innovator's Magazine **MAY 1972**

**The Power
of a
GC/Mass
+ Spec/Computer
System**

Shaping the Future 262
Sister M. Clare Markham and
Selwyn Enzer

**The Small Companies View
of Licensing 269**
Norman A. Jacobs

**What Kinds of Executives Cause Labor
Troubles? 272**
A. A. Imberman

Through China with Paddle and Ph.D. 276
J. Rufford Harrison

Magnets That Attract Hydrogen 280
H. Zijlstra

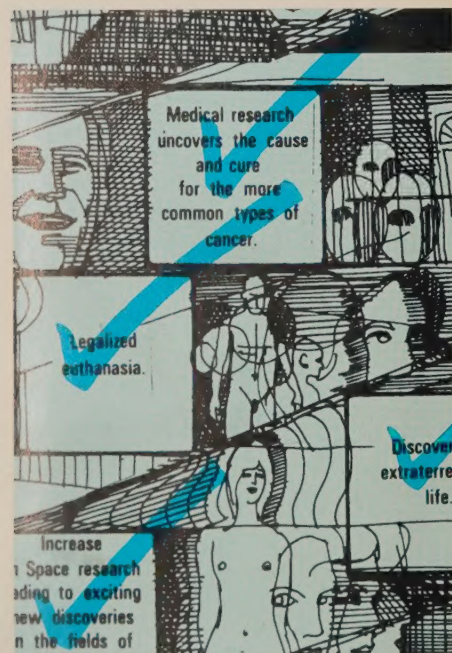
**Catalyst Studies with the Flow
Microbalance 285**
F. E. Massoth

Some Aspects of Coal Research 292
George R. Hill

Plastic Pipe and How It Grows 298
Richard S. Lindstrom and John T. Howarth

Lubrication with Solids 302
D. H. Buckley and R. L. Johnson

Fluorinated Epoxy Resins 311
James R. Griffith, Jacques G. O'Rear,
and Scott A. Reines



Shaping the Future
Sister M. Clare Markham and
Selwyn Enzer

Check List

The Industrial Chymist 257

Shopping List 258

Brownstein's Closet 259

Books 261

View from the Top, Jesse Werner 317

Out in the Plant 318

The Last Word 320

☐ Licensing is a way to extend the benefits of technology. Jacobs discusses how smaller companies view this activity. 269

☐ Job unrest seems to be associated with certain executive traits. Imberman identifies them explicitly. Common sense should long since have abolished them but hasn't. 272

☐ When China asked the U. S. Table Tennis Team to call it was a chemist who received the invitation. Here, that chemist, "Ruff" Harrison, relates his impressions of the visit. 276

☐ What good are magnets that attract hydrogen? That question is raised by the article by Zijlstra, who discovered this unexpected phenomenon while trying to compact intermetallic lanthanide compounds. 280

☐ Examination of a working catalyst while it is working is possible with the flow microbalance described by Massoth. He gives some case histories of its uses. 285

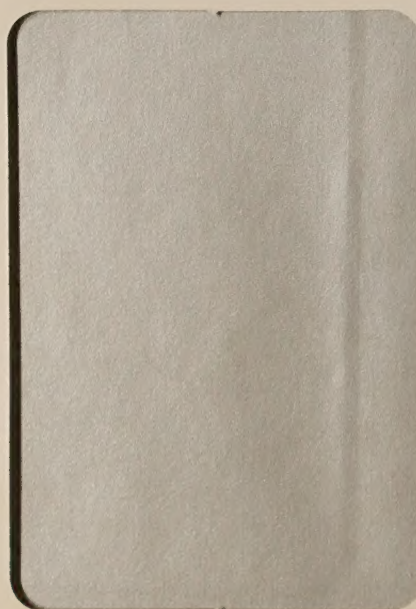
☐ Coal continues to intrigue Hill, the most recent Storch Medalist. Here he talks about some work in progress. 292

☐ Pipe for many process applications is now made of plastics in variety. Lindstrom and Howarth illustrate several of them in discussing this growing market for polymeric materials. 298

☐ Solid lubricants are daily meeting new demands. Properties required of and offered by them are outlined by Buckley and Johnson in this discussion of their mode of action. 302

☐ The unique abilities of fluorine to modify materials is here related to epoxy resins, which are pretty unique to begin with. Griffith, O'Rear, and Reines review efforts in this direction. 311

☐ What happens when a hundred people try to decide what elements of technology will be important in the future is illustrated by the report of a conference on the future written by two of its sponsors, Markham and Enzer. Why not order their list of priority items yourself? 262



the half-life
of a 1940
engineering
graduate
was twelve years,
it has shrunk
to five years
for today's
graduate ...

Check List

- The Light Side of Smog** 330
Arie J. Haagen-Smit
- Organizing the Small Research Project with PERT** 336
Roger Walck
- Survival Manual for Technologists** 340
Carl Pacifico
- Generalized Process Evaluation With Special Reference to Fertilizer Plants and Developing Countries** 343
J. R. Potter
- International Markets for Proteins and Amino Acids** 350
David Dworkin
- Chemical Technology—A High School Course with an Option** 354
Sheldon Abrams
- Solvent Selection via Miscibility Number** 359
Norman B. Godfrey
- The Power of a GC/Mass Spec/Computer System** 364
R. Venkataraghavan and F. W. McLafferty
- Ozone—Practical Aspects of Its Generation and Use** 368
E. W. J. Diaper
- Radiation Grafting to Cellulosic Fibers** 376
I. Sakurada

- The Industrial Chymist** 321
- View from the Top, R. T. Parfet, Jr.** 322
- Write On** 323
- Brownstein's Closet** 325
- Out in the Plant** 328
- Books** 382
- The Last Word** 384

☐ How a fragrance chemist got involved with air pollution and how he discovered photochemical smog is told by the first Cottrell Medalist, Arie Haagen-Smit. His program for future action is also included. 330

☐ Research no longer just happens. It's planned. A tool for successful R&D planning is presented by Walck who shows how PERT is used fruitfully in projects of many complexities. 336

☐ Pacifico starts his series on Survival in Industry with some thoughts on getting and starting THE job. 340

☐ The cost elements of building and running a plant are illustrated by Potter who uses a fertilizer project as his example. The elements and uses of prospective and retrospective costing are particularly well elucidated. 343

☐ Demands for protein throughout the world and their changing patterns are investigated by Dworkin to guide technologists in filling real needs. 350

☐ A program for training the "reluctant learner" is exemplified in this case history of a course that produces skilled technicians as well as successful college freshmen. Abrams' review of five years of the course he devised could serve as a model for in-house training as well as for other communities' high schools. 354

☐ Designing solvent systems for myriad applications is facilitated by use of Godfrey's system. 359

☐ If you want to know about ozone then water treatment is a good place to start. In this first of a two-part series, Diaper describes commercial ozone generators and their costs. 368

☐ Not all the modifications of fiber properties that are produced during irradiation are beneficial. Sakurada separates the good and bad effects quantitatively. 376

☐ The power of a close coupled system comprising a gas chromatograph/mass spectrometer/computer is defined by Venkataraghavan and McLafferty, who give examples of its use to solve some real problems. 364



R. Venkataraghavan and F. W. McLafferty





**Novelty and the Degeneration
of Progress 390**
Theodor Groeger

The Psychology of Keeping Up-to-Date 393
S. S. Dubin

The Birth of a Product 398
Bernard Foss and Hans A. Schaeffer

World Trade in Chemical Technology 402
Norbert Platzer

Input/Output Techniques in the CPI 405
Jay M. Gould and Marvin Katznelson

**Laser-Excited Raman Spectroscopy
2. Polymer Applications 411**
Jack L. Koenig

**The Revolution, Thermodynamics, and
Scientists' Roles 416**
Louis Burnelle

**Preclinical Evaluation of Antitumor
Agents 424**
Abraham Goldin

**Energy Barriers to Chemical Reactions.
Why, How, How Much? 434**
Andreas A. Zavitsas

**The Role of Resin Matrices in High
Performance Composites 440**
John M. Witzel, Richard J. Jablonski,
and Daniel Kruh

the half-life
of a 1940
engineering
graduate
was twelve years,
it has shrunk
to five years
for today's
graduate...

The Psychology of Keeping Up-to-Date
S. S. Dubin

Check List

The Industrial Chemist 385

Write On 386

Brownstein's Closet 387

View from the Top, Robert I. Wishnick 389

Challenge 447

The Last Word 448

☐ Must the world continue to grow more complex? Groeger addresses this question in examining our quest for novelty. 390

☐ How a product really happens is related by Foss and Schaeffer, who are concerned with one of the fastest moving product fields—cosmetics. 398

☐ A world view of new technology will be presented at the New York ACS meeting next month. Platzer, the symposium organizer, gives us a preview. 402

☐ Because the chemical industry is its own best customer, inter-relationships among companies take on special significance. One way of keeping track of who's doing what for whom is the Input/Output Table. Prior to this work of Gould and Katznelson such tables were too coarse to be of much help. But things are changing. 405

☐ Examination of polymers by Laser Raman continues Koenig's series on this exciting technique. 411

☐ Is environment for invention of importance? Burnelle tells how the Carnots—father and son—effected a revolution in thermodynamics in the midst of the French Revolution. 416

☐ The National Cancer Institute says, "We want to cure cancer in your lifetime." Goldin describes the first chemotherapeutic steps toward this goal. 424

☐ The topology of energy barriers and means for climbing them are investigated by Zavitsas. 434

☐ What makes a good matrix for a high performance composite is illustrated by Witzel, Jablonski, and Kruh. 440

☐ Realization that our technical knowledge is transitory is upsetting at best. Just how transitory and what's to be done is Dubin's specialty. 393



The Innovator's Mandate

AUGUST 1972



Check List

Edward de Bono's Concept Circus 456
Edward de Bono

People, Organization, and Process Implementation 459
Joseph Mizrahi

The Moss Bill 465
Michael Conner

Why Research Proposals Are Turned Down 468
Donald J. Lisk

Petroleum Genesis 471
Leon P. Gaucher

Prospects for Hydrogen-Fueled Vehicles 476
Roger J. Schoepel

Polyphenylene Sulfide Coating and Molding Resins 481
J. N. Short and H. Wayne Hill, Jr.

Toward Automated a priori Calculation of Thermophysical Properties 490
J. E. Bailey and T. R. Galloway

Ozone—Practical Aspects of Its Generation and Use
Part 2. Use 498
E. W. J. Diaper

Chemicals to Regulate Plant Growth 505
Clarence W. Huffman

The Industrial Chymist 449

Brownstein's Closet 450

View from the Top 452
Raymond J. Kenard, Jr.

Books 454

Challenge 486

Out in the Plant 510

Write on 511

The Last Word 512

It's said that you shouldn't undertake vast projects with half vast ideas. Today's vast project require vast numbers of people to implement it. How they interact, or fail to, is addressed by Mizrahi. 459

Is the patent legislation introduced by Congressman Moss really in the best interest of professionalism? Of society? Conner thinks not and tells why. 465

Since more industrial and academic research proposals are being turned down than ever, it's good to know why. Lisk has read enough of them to know. 468

Everyone knows that petroleum came from ancient organisms—everyone but Gaucher, that is. Here he describes his alternate—petroleum rain. 471

One good way to eliminate hydrocarbon and CO emissions from vehicles is to eliminate hydrocarbon fuels. Schoepel makes a good case for using hydrogen as a replacement. 476

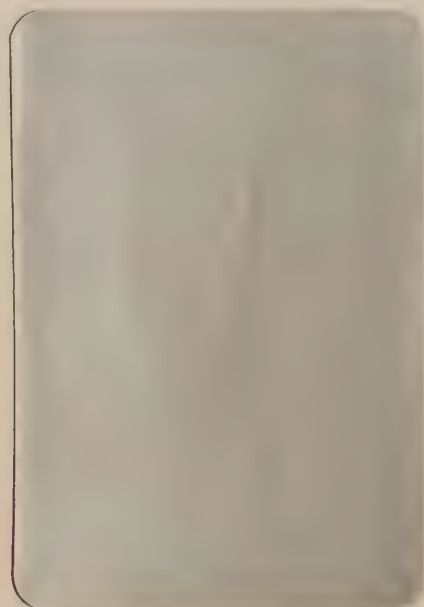
Now that polyphenylene sulfides are articles of commerce one should think about what they're good for. Short and Hill provide the background to do so. 481

Can computers convert molecular structure data to thermodynamic property estimates? Bailey and Galloway tried with some success. 490

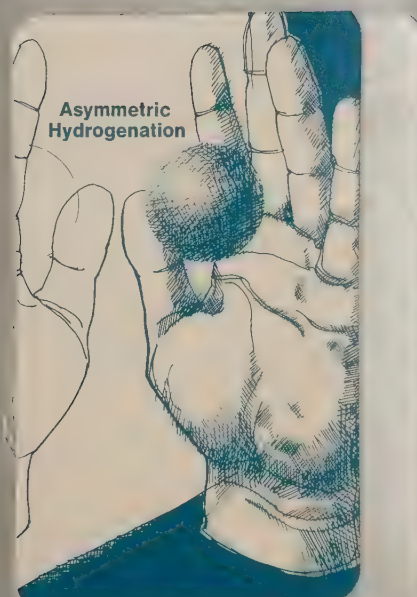
Since ozone is cheap enough on a large scale to be used to treat municipal water, it should be cheap enough to use for a lot of other things. Some of them are discussed by Diaper. 498

Using chemicals to adjust the way plants grow is a worthy but delicate undertaking. Nevertheless, according to Huffman, diverse structures have utility in exquisite variety. 505

Concepts make technology move. But most of us are trained in acquiring and using facts. There is a difference. De Bono makes it eminently clear. 456



The Innovative Materials SEPTEMBER 1972



Check List

Democracy, Christianity, and the Death of Western Civilization 522

Henry A. McGee, Jr.

Project Management and Its Conflicts—A View from Apollo 527

David L. Wilemon

Nonwovens: An Overview 535

Stanley E. Ross

Prostaglandins—A Status Report 540

Alan H. Nathan

Solvents for Coatings 547

Charles M. Hansen

Infrared Examination of a Catalyst in Action 554

Hydroformylation with Rhodium

Donald E. Morris and H. Burnham Tinker

Laboratory Computing with Real-Time BASIC 560

1. Background

Charles L. Wilkins and Charles E. Klopfenstein

Carbon Black from Coal 565

M. S. Iyengar, R. Haque, R. K. Chakrabarti, and M. L. Dutta

Fertilizer Use Throughout the World 570

Raymond Ewell

The Industrial Chymist 513

Shopping List 514

Brownstein's Closet 515

Write On 517

Out in the Plant 518

View from the Top 521

William R. Hewlett

The Last Word 576

☐ "Dear Prof. McGee, When a prominent chemical engineer titles a talk 'Democracy, Christianity, and the Death of Western Civilization,' I absolutely must read a transcript . . ." 522

☐ If nothing else, Project Apollo taught project management. Wilemon did an in-depth study of the conflicts involved and here reports some case histories. 527

☐ What are prostaglandins and what good are they or will they be? Nathan here shares Upjohn's answers. 540

☐ Solvents are important not only because of their technical effect but also because of their economic and environmental impacts. Hansen shows how to select solvents for coatings. 547

☐ If you really want to know how a catalyst works you've got to look at it while it's working. Morris and Tinker did just this in studying homogeneously catalyzed hydroformylation. They used a high pressure, high temperature I.R. set up. 554

☐ Here starts a series on BASIC, an easy computer language. Its use in chemistry is introduced by Wilkins and Klopfenstein, who will illustrate other uses later. Still later Szoni will demonstrate BASIC's use in experimental design and interpretation. 560

☐ Carbon black is one of the largest volume chemicals sold. It could be made economically from coal according to Iyengar, Haque, Chakrabarti and Dutta. 565

☐ The worldwide impact of fertilizer extends well beyond the fact that among chemicals it's very big business. Not only is fertilizer usage a basic determinant of human nutrition; it also is a critical environmental factor. Ewell here summarizes UNIDO data on the global picture. 570

☐ Woven fabrics haven't basically changed since the Egyptians were weaving mummy wrappings. But nonwovens now are here to stay according to Ross' treatment of their technology. 535



Nonwovens: An Overview

Stanley E. Ross



Come to the fair...
in Canton



Check List

What THEY Think 582
ugh Hoffman

Survival Manual for Technologists
Part II 587
Carl Pacifico

Asymmetric Hydrogenation Yields
 α -Amino Acids 590
W. S. Knowles, M. J. Sabacky, and
B. D. Vineyard

Some New Definitions in the Buyer-Seller
Relationship 594
Gerald B. Zornow

Patent Office Procedures 599
Arthur P. Kent

Some Fermentation Forecasts 606
Ira D. Hill

Fungicides without Mercury 609
H. Donald Snyder

Remember the Hyperbola!
Curve Fitting and Iteration with a
Three Constant Equation 614
Edward C. Hohmann and Frank J. Lockhart

Fluidic Control Can Be Simple 620
G. Standen and R. Fortier

Liquid Fertilizer—Production
and Distribution 627
Travis P. Hignett

The Industrial Chymist 577

View from the Top, Irving S. Shapiro 578

Brownstein's Closet 579

Books 581

T & E 638

The Last Word 640

□ One of the problems technologists have in relating to THEM—the great unwashed mass we call society—is that THEY are not like US. Hoffman has characterized THEM by surveying their attitudes—particularly with regard to our efforts. 582

□ Now that you've got the job, Pacifico, in this second part of his Industrial Survival Manual, tells you how to hold it. 587

□ What salesmen say to purchasing agents is bound to be interesting. All the more so when the salesman, Zornow, is president of one of our major firms. 594

□ Here is the life history of a U.S. Patent Application as told by Kent, of the Patent Office. 599

□ What ever became of the glowing prognostications about fermentation of hydrocarbons *et al*? Hill's answers aren't too encouraging. 606

□ When mercury is gone what are we to do to prevent fungal attack? Although, according to Snyder, we're on our way, there is challenge here for organiker and microbiologist alike. 609

□ The lovely thing about straight-line correlations is that they are easily recognized (and sometimes too easily extrapolated). Hohmann and Lockhart now show how to correlate a variety of kinds of data with the hyperbola. 614

□ Fluidics have been much neglected by the CPI. That their use in control and computation really is simple is demonstrated by Standen and Fortier. 620

□ Production and distribution of liquid fertilizer is used to demonstrate how technology and business, working together, can respond to societal need. Hignett views this fastest-growing agricultural area. 627

□ Finally man can generate optically active compounds *without* using optically active reagents. How? The same way nature does: by using optically active catalysts. Thus Knowles, Sabacky, and Vineyard make L-Dopa and other active amino acids with homogeneously dispersed metal complexes. 590



W. S. Knowles,
M. J. Sabacky, and
B. D. Vineyard



HEMTECH

The Innovator's Magazine NOVEMBER 1972

Contents



Come to the Fair . . . in Canton	648
Julian M. Sobin	
Plant Investment vs. Profitability	652
E. P. Doane	
Can the Chemical Industry Afford Research?	656
Ronald D. Clark	
We Thought You Should Know	
"Williams & Wilkins vs. The United States"	
A Digest of Commissioner Davis' Report to the Court	660
Cost, Time and Pesticide Safety	666
Julius E. Johnson and Etyl H. Blair	
Production of Dimethylformamide from HCN	670
Y. Fukuoka and N. Kominami	
Unmanned Exploration of Mars	
An Experiment in Engineering Education	675
J. W. Moore, R. L. Wehe, and S. Yerazunis	
Laboratory Computing with Real-Time BASIC	
Part II: Some Examples	681
Charles L. Wilkins and Charles E. Klopfenstein	
Polymers via Friedel-Crafts Alkylation	687
A. Fritz	
The Interstitial Fluid Bed Reactor	690
Edward N. Ziegler	

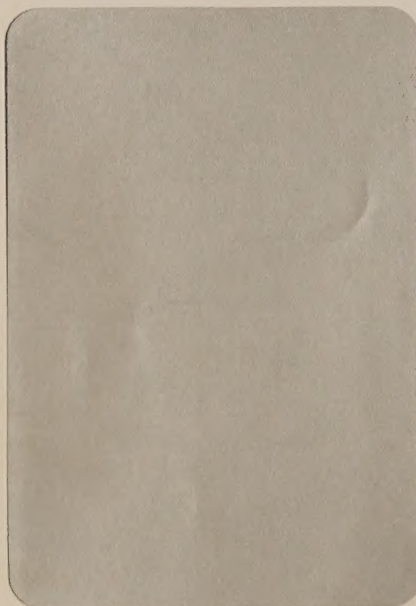
Come to the fair... in Canton



Julian M. Sobin

Check List

The Industrial Chymist	641
Books	642
Guest Editorial, Gordon L. Nelson	643
Shopping List	644
Brownstein's Closet	645
EUROTECH	647
Challenge	695
View from the Top, Arthur M. Bueche	697
Out in the Plant	701
The Last Word	704



☐ Now that the computer has taken the drudgery out of evaluating capital investment opportunities, we can look at more cases, more perturbations. Here Doane demonstrates what can be done. He looked at the effects of inflation and pollution abatement on profitability of, in this case, an herbicide. 652

☐ "Can the CPI afford research?" What a question! Yet Clark has asked it and provided answers. Some of them are negative. 656

☐ What is really involved when you ask for a photocopy is still in the courts, but Williams and Wilkins has reviewed for us the present state of affairs. It's worth some thought. 660

☐ The road to new pesticides gets rockier every day. For a quantitative perspective, read Johnson and Blair's case histories. 666

☐ There's a new process for that ubiquitous solvent—DMF. Early details come to us from Kominami and Fukuoka in Japan. 670

☐ When students from two universities hooked up with NASA to solve a real multidisciplinary problem, the results were bound to be interesting. Moore, Wehe, and Yerazunis review this unique, on-going pedagogical experiment. 675

☐ In Part II of their series on uses of BASICS in the lab, Wilkins and Klopfenstein give some examples from kinetics, spectral analysis, and the like. 681

☐ Polymers with alternating aromatic and aliphatic groups have been made by Fritz. Good chemistry; good properties. 687

☐ Ziegler thinks the combination of a fixed and a fluid bed in one shell offers greater promise than either unit alone. His preliminary results demonstrate why. 690

☐ What are the real prospects offered to the American CPI by the 800 million people in China? Few Americans have gone there to find out. Sobin was one who did. Here's what he learned. 648

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11 *Business Week* we learned
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Check List

The Big Blow-Up 710
Roger E. Payne and Carl E. Snyder

Some Catalytic Thoughts 716
Adalbert Farkas

**Process Economics by Computer—
The Case of Fish Protein Concentrate** 717
Herbert G. Blecker and Thomas M. Nichols

**TOXICON: An On-Line Toxicology
Information Service** 727
Henry M. Kissman and Donald J. Hummel

The Polymerization of Pivalolactone 728
N. R. Mayne

**Coulometric Titration—New Emphasis
on an Old Technique** 734
Stanford L. Tackett

**Fiber Forming and Thermal Properties
of Polyesters of Group IV Metals** 741
Charles E. Carraher, Jr.

My Seventy-Six Years in Research 745
E. Emmet Reid

The Industrial Chymist 705

View from the Top, Duncan S. Davies 706

Brownstein's Closet 707

Write On 709

Books 759

Index 772

The Last Word 776

☐ Since "product recall" is so popular in Detroit, Farkas, in his after dinner talk before the International Catalysis Society, suggests we apply it to . . . well, read on. 716

☐ Technologists have for a long while been pursuing an elusive goal: An explicit relationship whose inputs are thermodynamic properties and whose output is return on investment. Blecker and Nichols have come pretty close with their CØ\$T system. Here they exemplify it by comparing a variety of plants to make Fish Protein Concentrate. 717

☐ Is it toxic? Under what conditions? What are the symptoms? Now you can dial a phone and find out, providing that Kissman and Hummel and their TOXICON System are at the other end of the line. 727

☐ Here's a polyester made from β -pivalolactone— $\text{O}-\text{C}(=\text{O})-\text{O}$ Mayne describes it and its manufacture. 728

☐ Are you missing something in not using coulometric titration? Tackett characterizes some problems that can be solved that way and tells how. 734

☐ How about a polyester chain with metal atoms in the chain? Carraher has made some that make minifibers that have good thermal stability. 741

☐ We can't adequately describe what Professor Emmet Reid wrote during his one-hundredth year—yes, he's going on 101—except to say, "It's a joy!" 745

☐ Here's CHEMTECH's second annual index. We've tried to make it easy to find out if you missed anything in '72. 772

☐ A column of air is a whale of a lot cheaper structural member than a column of anything else. Payne and Snyder therefore thought you'd be interested in all the kinds of structures that air and other fluids encased in polymer films can support. 710



The Big Blow-Up
Roger E. Payne and Carl E. Snyder